

CLAIMS

1. A metal colloid comprising: a solvent composed of water or a mixed solvent of water and an organic solvent; cluster particles comprising one or more metal species; and a protective agent for protecting the cluster particles,
- 5 wherein the protective agent is a polymeric material which can be bound to one or more ion species selected from the group consisting of alkali earth metal ions, transition metal ions, rare earth metal ions, an aluminum ion and a gallium ion.
- 10 2. A metal colloid comprising: a solvent composed of water or a mixed solvent of water and an organic solvent; cluster particles comprising one or more metal species; and a protective agent for protecting the cluster particles,
- wherein the protective agent comprises a polymeric material which can be bound to one or more ion species selected from the group consisting of
- 15 alkali earth metal ions, transition metal ions, rare earth metal ions, an aluminum ion and a gallium ion, and
- the protective agent has one or more ion species selected from the group consisting of alkali earth metal ions, transition metal ions, rare earth metal ions, an aluminum ion and a gallium ion bounded thereto.
- 20 3. The metal colloid according to claim 1 or 2, wherein the protective agent is a polymeric material having a nitrogen atom(s) and/or a carboxyl group(s) in its molecule.
- 25 4. The metal colloid according to claim 3, wherein the polymeric material constituting the protective agent meets any of the following requirements:

(a) when the polymeric material has nitrogen atoms, the number of nitrogen atoms / (the number of carbon atoms + the number of nitrogen atoms + the number of oxygen atoms) is 0.08 to 0.4;

5 (b) when the polymeric material has carboxyl groups, the number of COOH atomic groups / (the number of carbon atoms + the number of nitrogen atoms + the number of oxygen atoms) is 0.02 to 0.3; and

(c) when the polymeric material has both nitrogen atoms and carboxyl groups, (the number of nitrogen atoms + the number of COOH atomic groups) / (the number of carbon atoms + the number of nitrogen atoms + the number
10 of oxygen atoms) is 0.02 to 0.4.

5. The metal colloid according to any of claims 1 to 4, wherein the protective agent is any one selected from the group consisting of polyethyleneimine, polyallylamine, poly(N-carboxymethyl)allylamine,
15 poly(N,N-dicarboxymethyl)allylamine and poly(N-carboxymethyl)ethyleneimine.

6. The metal colloid according to any of claims 1 to 5, wherein the cluster particles comprise at least one metal species selected from the group
20 consisting of gold, platinum, silver, palladium, rhodium, iridium, ruthenium and osmium.

7. A catalyst prepared by calcining the metal colloid according to any of claims 1 to 6.